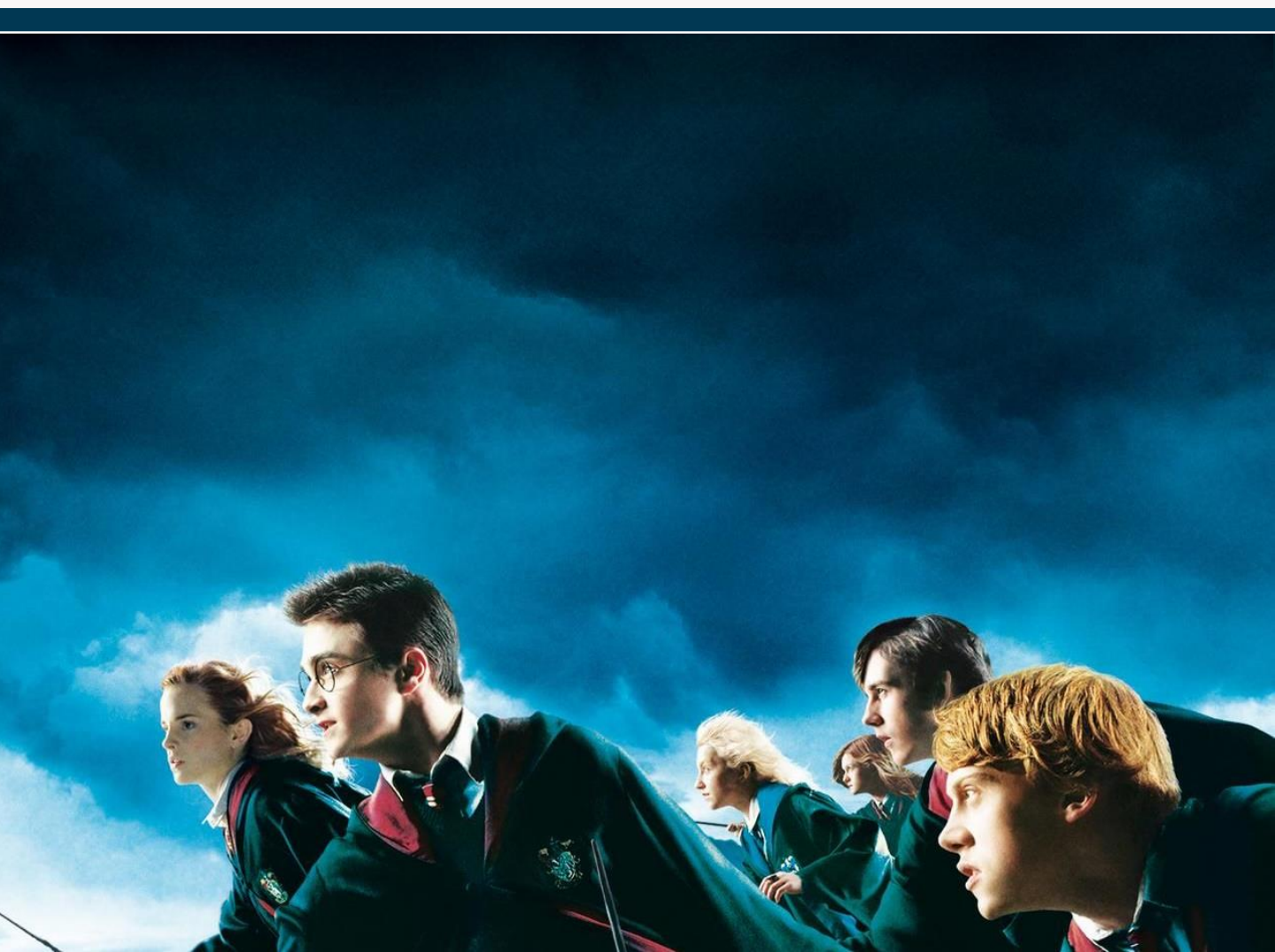


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MATHEMATICAL MODELING



8.1 MATHEMATICAL MODELING

DIAGON ALLEY

➤ MATHEMATICAL MODELLING

- A representation of system or scenario that is used to gain qualitative and/or quantitative understanding of some real-world problems and to predict future behaviour

➤ Important components

- 1) Identifying and defining the problems
- 2) Making assumptions and identifying the variables
- 3) Applying mathematics to solve problem
- 4) Verifying and interpreting solutions in the context of the problem
- 5) Refining the mathematical model
- 6) Reporting the findings

➤ Example and solution

- Amin travelled 405 km on 45 litres of petrol in his car. If Amin wishes to go to a place which is 198km away by car, how much petrol in litres, does he need? solve this problem through mathematical modeling

➤ Identifying and defining the problem

- Determine the volume of petrol required for 198 km.
- We know that the farther we travel, the more petrol we require. Thus, the amount of petrol varies directly with the distance we travelled



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8.1 MATHEMATICAL MODELING

DIAGON ALLEY

➤ Making assumptions and identifying the variables

- Assume that the driving speed for both 405 km and 198 km routes are the same
- • Let x represents the distance travelled and y represents the amount of petrol required
- • y varies directly with x , hence $y = kx$ where k is a constant

➤ Applying mathematics to solve problem

Substitute $y = 45$ and $x = 405$ into $y = kx$,

$$45 = k(405)$$

$$k = \frac{45}{405} = \frac{1}{9}$$

$$\text{Therefore, } y = \frac{1}{9}x$$

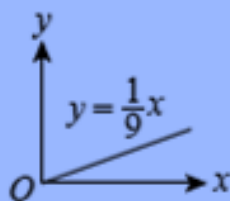
This equation describes the relationship between the amount of petrol required and distance travelled.

$$\begin{aligned}\text{When } x = 198, y &= \frac{1}{9}(198) \\ &= 22 \text{ litres}\end{aligned}$$

Hence, 22 litres of petrol is required to travel 198 km.

➤ Verifying and interpreting solutions in the context of the problem

We may not be able to use the linear function model $y = \frac{1}{9}x$ in all situations. For example, if the 405 km route is through towns and cities, and the 198 km route is through highway. Thus, the car will use up petrol at a faster rate in the first route compared to the second route. When this is translated to the real-world situation, the linear function model obtained is not suitable to solve this problem.



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8.1 MATHEMATICAL MODELING

DIAGON ALLEY

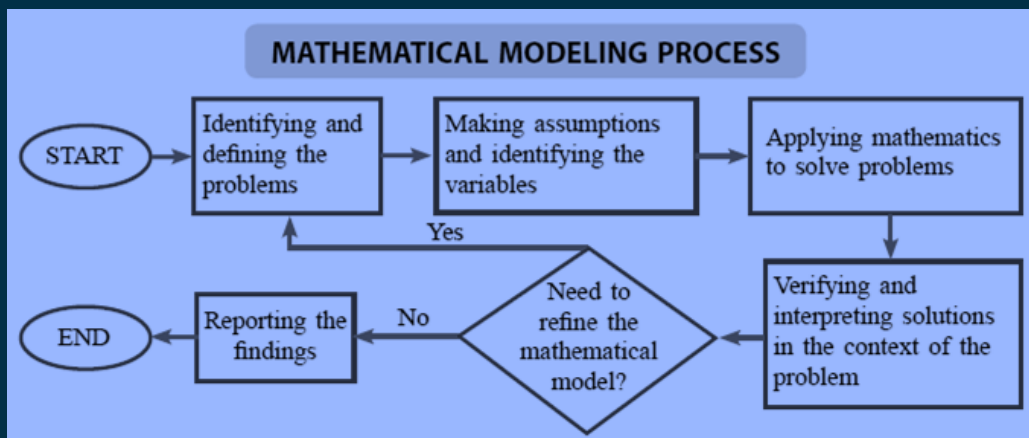
➤ Refining the mathematical model

- In this problem, we are not able to refine the model due to limited information given

➤ Reporting the Findings

- Report the findings of the problem solving based on the interpretation of solution as shown in the preceding sections.

➤ CONCLUSION



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